WHAT IS CLAIMED IS:

1. A method for estimating at least one measurement/object property of a metal object, said method comprising:

generating a time-varying eddy current in a wall of the metal object utilizing a pulsed-signal transmitter;

measuring the time-varying eddy current;

fitting said time-varying measured eddy current to a parameterized polynomial; and

interpreting the parameterized polynomial to determine the at least one measurement/object property of the metal object.

2. A method in accordance with Claim 1 wherein said interpreting the parameterized polynomial further comprises removing a constant term from the polynomial.

3. A method in accordance with Claim 1 wherein said interpreting the parameterized polynomial further comprising normalizing the polynomial to a unit first power term.

4. A method in accordance with Claim 3 wherein said interpreting the parameterized polynomial comprises applying a calibrated transfer function to parameters of the normalized parameterized polynomial to estimate a measurement/object property.

5. A method in accordance with Claim 4 wherein said measurement/object property is wall thickness.

6. A method in accordance with Claim 4 wherein said measurement/object property is permeability.

7. A method in accordance with Claim 4 wherein said measurement/object property is conductivity.

8. A method in accordance with Claim 4 wherein said measurement/object property is sensor liftoff.

9. A method in accordance with Claim 4 wherein said measurement/object property is selected from the group consisting of wall thickness, permeability, conductivity, and sensor liftoff, and further wherein said metallic object is inaccessible to visual inspection and said measuring a time-varying eddy current resulting from said generated magnetic field comprises measuring said eddy current utilizing a sensor having an indeterminate standoff from a surface of the metallic object.

10. A method in accordance with Claim 4 wherein said transfer function is a non-linear transfer function.

11. A method in accordance with Claim 4 further comprising deriving said transfer function utilizing independent measurements on calibration samples.

12. A method in accordance with Claim 4 further comprising deriving said transfer function utilizing finite element computational simulations.

13. An apparatus for estimating at least one measurement/object property of a metal object, said apparatus comprising:

a drive coil;

a pulse generator operable to energize said drive coil in a pulsed manner to transmit a transient electromagnetic flux to into a metal object under inspection;

at least one sensor operable to sense and generate output signals representative of time varying eddy currents produced in the metal object under inspection from said transient electromagnetic flux;

a processor operatively coupled to said at least one sensor and configured to:

measure the output signals representative of the time-varying eddy currents resulting from said transient electromagnetic flux;

fit the measured output signal to a parameterized polynomial; and

interpret the parameterized polynomial to determine the at least one measurement/object property of the metal object.

14. An apparatus in accordance with Claim 13 wherein to interpret the parameterized polynomial, said apparatus is configured to remove a constant term from the polynomial.

15. An apparatus in accordance with Claim 13 wherein to interpret the parameterized polynomial said apparatus is configured to normalize the polynomial.

16. An apparatus in accordance with Claim 15 wherein to interpret the parameterized polynomial, said apparatus is configured to apply a calibrated transfer function to parameters of the normalized parameterized polynomial to estimate a measurement/object property.

17. An apparatus in accordance with Claim 16 wherein said measurement/object property is wall thickness.

18. An apparatus in accordance with Claim 16 wherein said measurement/object property is permeability.

19. An apparatus in accordance with Claim 16 wherein said measurement/object property is conductivity.

20. An apparatus in accordance with Claim 16 wherein said measurement/object property is sensor liftoff.

21. An apparatus in accordance with Claim 16 wherein said measurement/object property one or more measurement/object property selected from the group consisting of wall thickness, permeability, conductivity, and sensor liftoff.

22. An apparatus in accordance with Claim 16 wherein said transfer function is a non-linear transfer function.

23. An apparatus in accordance with Claim 16 wherein said processor further comprises a memory, and said transfer function is stored in said memory.

24. An apparatus for estimating at least one measurement/object property of a metal object, said apparatus comprising:

a drive coil;

a pulse generator operable to energize said drive coil in a pulsed manner to transmit a transient electromagnetic flux to into a metal object under inspection;

at least one sensor operable to sense and generate output signals representative of time varying eddy currents produced in the metal object under inspection from said transient electromagnetic flux;

a processor operatively coupled to said at least one sensor and configured to:

measure the output signals representative of the time-varying eddy currents resulting from said transient electromagnetic flux;

fit said output signals to a parameterized polynomial;

reconstruct a smoothed version of the measured eddy current using fitted parameters of the parameterized polynomial;

resample the reconstructed eddy current using a number of sample points; and

interpret the reconstructed eddy current to determine a measurement/object property of the metal object.

25. An apparatus in accordance with Claim 24 wherein to resample the reconstructed eddy current, said apparatus is configured to logarithmically resample the reconstructed eddy current.

26. An apparatus in accordance with Claim 24 configured to resample the reconstructed eddy current using a number of sample points approximately equal to an order of fit of the fitted parameters.

27. An apparatus in accordance with Claim 26 wherein said resampling comprises logarithmic resampling.

28. An apparatus in accordance with Claim 24 further configured to remove a DC offset from and normalize the resampled, reconstructed eddy current, and wherein to interpret the reconstructed eddy current to determine a measurement/object property of the metal object, said apparatus is configured to interpret the normalized and offset-removed resampled, reconstructed response.

29. A method for estimating at least one measurement/object property of a metal object, said method comprising:

generating a time-varying eddy current in a wall of the metal object utilizing a pulsed-signal transmitter;

measuring the time-varying eddy current;

fitting said time-varying measured eddy current to a parameterized polynomial;

reconstructing a smoothed version of the measured eddy current using the fitted parameters;

resampling the reconstructed eddy current using a number of sample points;

interpreting the reconstructed eddy current to determine a measurement/object property of the metal object.

30. A method in accordance with Claim 29 wherein said resampling comprises logarithmic resampling.

31. A method in accordance with Claim 29 wherein said resampling comprises resampling using a number of sample points approximately equal to an order of fit of the fitted parameters.

32. A method in accordance with Claim 31 wherein said resampling comprises logarithmic resampling.

33. A method in accordance with Claim 29 further comprising removing a DC offset from and normalizing the resampled, reconstructed response, and wherein said interpreting the reconstructed eddy current to determine a measurement/object property of the metal object comprises interpreting the normalized and offset-removed resampled, reconstructed response.